

FINAL

**REMEDIAL DESIGN WORK PLAN
FOR OPERABLE UNIT 4 SILOS 1 AND 2 PROJECT**

**AT THE
UNITED STATES DEPARTMENT OF ENERGY
FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO**

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TABLE OF CONTENTS

1.0	INTRODUCTION.....	1-1
1.1	Scope and Purpose of Operable Unit 4 Silos 1 and 2 Remedial Design Work Plan	1-1
1.2	Background.....	1-2
2.0	REMEDIAL DESIGN SCOPE AND STRATEGY.....	2-1
2.1	Scope of the Silos 1 and 2 Remedial Action	2-1
2.2	Silos 1 and 2 Remediation Contract Strategy.....	2-2
2.3	FEMP Remediation Contract Strategy.....	2-4
3.0	SILOS 1 AND 2 REMEDIAL DESIGN IMPLEMENTATION.....	3-1
3.1	Remedial Design Process.....	3-1
3.2	Remedial Design Submittals	3-2
3.2.1	<i>Receipt of Contractor Schedule.....</i>	<i>3-2</i>
3.2.2	<i>Site Preparation Package.....</i>	<i>3-2</i>
3.2.3	<i>Remedial Design Package.....</i>	<i>3-3</i>
3.2.4	<i>Remedial Action Work Plan</i>	<i>3-4</i>
4.0	SCHEDULE FOR THE SILOS 1 AND 2 REMEDIAL DESIGN	4-1
5.0	BIBLIOGRAPHY	5-1

LIST OF TABLES

Table 4-1	Milestones for the Silos 1 and 2 Remedial Design	4-1
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ACRONYMS AND ABBREVIATIONS

ACA	Amended Consent Agreement
ARARs	applicable or relevant and appropriate requirements
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act, as amended
D&D	Decontamination and Demolition
DOE	U.S. Department of Energy
DOE-FEMP	U.S. Department of Energy-Fernald Environmental Management Project
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
FEMP	Fernald Environmental Management Project
FS/PP	Feasibility Study/Proposed Plan
NTS	Nevada Test Site
OEPA	Ohio Environmental Protection Agency
OU	Operable Unit
PCDF	Permitted Commercial Disposal Facility
RA	Remedial Action
RAWP	Remedial Action Work Plan
RD	Remedial Design
RDWP	Remedial Design Work Plan
RFP	Request for Proposal
ROD	Record of Decision
RCS	Radon Control System
TTA	Transfer Tank Area
VITPP	Vitrification Pilot Plant
WAC	Waste Acceptance Criteria

1.0 INTRODUCTION

1.1 Scope and Purpose of Operable Unit 4 Silos 1 and 2 Remedial Design Work Plan

This Remedial Design Work Plan (RDWP) documents the strategy for detailed planning and design of the selected remedy to treat Operable Unit 4 (OU4) Silos 1 and 2 material. This RDWP describes the process for selecting a contractor for retrieval and transfer of Silos 1 and 2 material from the Transfer Tank Area (TTA), followed by treatment using a chemical stabilization technology and packaging for shipment and disposal. This RDWP also describes the process and schedule for planning, designing, and implementing the selected remedy.

This RDWP establishes an enforceable milestone for awarding a remediation contract for implementation of the Silos 1 and 2 remedy. After contract award, the U.S. Department of Energy-Fernald Environmental Management Project (DOE-FEMP) will submit a project schedule to the U.S. Environmental Protection Agency (EPA) and the Ohio Environmental Protection Agency (OEPA) for review and approval. The project schedule will identify additional enforceable milestones for the submittal of the Remedial Design (RD) Package and the Remedial Action Work Plan (RAWP). The RAWP will establish enforceable milestones for implementation of the remedy.

The selected contractor shall remediate the Silos 1 and 2 material in accordance with the requirements identified in the "Record of Decision (ROD) for Remedial Actions at Operable Unit 4," December 1994, as modified by the "Record of Decision (ROD) Amendment for Operable Unit 4 Silos 1 and 2 Remedial Actions," July 2000. Only the selected remedy for the Silos 1 and 2 material, as approved in the original ROD and modified in the ROD Amendment for the treatment technology component for Silos 1 and 2 material and disposal of contaminated soil and debris, is addressed in this RDWP. Implementation of other portions of the OU4 remedy addressed in the original OU4 ROD, as modified by the "Final Explanation of Significant Differences (ESD) for Operable Unit 4 Silo 3 Remedial Action" are documented in other planning documents.

1.2 Background

The EPA approved and signed the original OU4 ROD on December 7, 1994. The selected remedy consisted of the following components:

- Removal of the contents of Silos 1, 2, and 3 and the decant sump tank sludge.
- Treatment of the Silos 1, 2, and 3 material and sludges removed from the silos and the decant sump tank by vitrification to meet the Nevada Test Site (NTS) waste acceptance criteria (WAC).
- Off-site shipment of the vitrified contents of Silos 1, 2, and 3 and the decant sump tank for disposal at the NTS.
- Demolition of Silos 1, 2, 3 and 4 and decontamination, to the extent practicable, of the concrete rubble, piping, and other generated construction debris.
- Removal of the earthen berms and excavation of the contaminated soils within the boundary of OU4, to achieve remediation levels. Placement of clean backfill to original grade following excavation.
- Demolition of the remediation and support facilities after use. Decontamination or recycling of debris before disposition.

- 1 • On-property interim storage of excavated contaminated soils and contaminated
2 debris in a manner consistent with the approved *Work Plan for FEMP Removal*
3 *Action No. 17 - Improved Storage of Soil and Debris* (DOE 1996)¹, pending final
4 disposition of soil and debris in accordance with the RODs of OUs 5 and 3,
5 respectively.
- 6 • Continued access controls and maintenance and monitoring of the stored waste
7 inventories.
- 8 • Institutional controls of the OU4 area such as deed and land-use restrictions.
- 9 • Potential, additional treatment of stored OU4 soil and debris using OU5 and OU3
10 waste treatment systems.
- 11 • Pumping and treating, as required, of any contaminated perched groundwater
12 encountered during remedial activities.
- 13 • Disposal of the OU4 FEMP contaminated debris and soils consistent with the RODs
14 for OUs 3 and 5, respectively.

15 Although the selected remedy documented in the original OU4 ROD specifies that on-site
16 disposal for the OU4 soil and debris was preferred, the final decision regarding the
17 disposition of the OU4 debris and soils was placed in abeyance, until the OU3 and OU5
18 RODs were completed. This approach allowed DOE to take full advantage of planned
19 waste management and treatment strategies developed by these OUs and enabled the
20 integration of disposal decisions for OU4 contaminated soils and debris on a site-wide
21 basis.

¹ This component of the selected remedy was documented in the original Operable Unit 4 Record of Decision in 1994. However, for purposes of this Remedial Design Work Plan, the reference has been updated to the most recent revision.

1 The original OU4 RDWP was approved by the EPA on June 15, 1995. As part of the
2 strategy outlined in the RDWP, the DOE-FEMP conducted several pilot-scale treatability
3 studies on-site and conducted several other treatability studies off-site in partnership with
4 the academic community. Vitrification Pilot Plant (VITPP) Phases I and II Treatability Study
5 Programs were integrated directly into the OU4 RD/RA program to collect quantitative
6 performance data to support the application of the vitrification technology for the
7 remediation of the silos materials.

8 Phase I VITPP testing activities began June 19, 1996, with initiation of the first of four
9 campaigns. During the treatability study program, many technical and operational
10 difficulties were encountered. Attempts to resolve technical and operational issues during
11 VITPP operations resulted in documented schedule and cost increases.

12 In September 1996, the DOE formally requested extension of enforceable RD/RA
13 milestones associated with implementing vitrification of the silos material. In October
14 1996, the EPA denied DOE's request. The EPA and DOE then initiated the formal dispute
15 resolution process under the Amended Consent Agreement, as amended (ACA) and began
16 reevaluating the path forward for remediation of the silos material.

17 During the final stages of the last campaign of the VITPP Phase I Testing Program, the
18 melter hardware failed (December 26, 1996).

1 On July 22, 1997, the DOE-FEMP and the EPA formally approved an, "Agreement
2 Resolving Dispute Concerning Denial of Request for Extension of Time for Certain OU4
3 Milestones" [hereafter referred to as "the Settlement"]. The Settlement resolved disputes
4 concerning the schedule and path forward for the remediation of the Silos 1, 2, and 3
5 materials. In the Settlement, EPA and DOE-FEMP agreed that DOE-FEMP would
6 supplement the original OU4 Feasibility Study/Proposed Plan (FS/PP) to evaluate
7 vitrification and other alternatives for treatment of the Silos 1 and 2 material. DOE-FEMP
8 would then amend the OU4 ROD based on conclusions resulting from the evaluation. In
9 addition, it was agreed that remediation of the Silo 3 material should be separated from
10 remediation of the Silos 1 and 2 material and that an ESD be prepared identifying the RA
11 changes for the Silo 3 material.

12 An ESD was completed by DOE-FEMP and approved by the EPA in March 1998 to
13 document the change in remedy for treatment and disposal of the Silo 3 material. The
14 EPA signed the Final ROD Amendment for Silos 1 and 2 Remedial Action on July 13,
15 2000.

16 The ROD Amendment addresses the re-evaluation of the treatment component of the
17 selected remedy for the remediation of the OU4 Silos 1 and 2 material at the FEMP Site in
18 Fernald, Ohio. The remedial action identified in the ROD Amendment was selected in
19 accordance with the Comprehensive Environmental Response, Compensation, and Liability
20 Act, as amended (CERCLA) and the National Oil and Hazardous Substances Pollution
21 Contingency Plan (40 Code of Federal Regulations Part 300).

1 The decision was based on the information in the administrative record for OU4, which is
2 maintained in accordance with CERCLA. The major documents prepared through the
3 CERCLA process include the Remedial Investigation, the FS/PP, and the ROD for OU4, and
4 the revised FS/PP and the ROD Amendment for the Silos 1 and 2 material. This decision
5 also considered state and stakeholder input, including input received during the public
6 hearing held in Fernald, Ohio and the public meeting held in Las Vegas, Nevada following
7 the issuance of the revised FS/PP for the Silos 1 and 2 material. DOE considered all
8 comments received during the public comment period on the revised FS/PP for the Silos 1
9 and 2 material in the preparation of the ROD Amendment.

10 The State of Ohio concurred with the remedy and the applicable or relevant and
11 appropriate requirements (ARARs) put forth in the ROD Amendment for the remediation of
12 the OU4 Silos 1 and 2 material.

13 Section XI.A of the ACA requires that a RDWP, specifically for the Silos 1 and 2 Project,
14 be submitted to the EPA for review and approval within 60 days of EPA signing the ROD
15 Amendment.

16 As part of the path forward for Silos 1 and 2 remediation, a contract was awarded in
17 February 1999 to retrieve the entire contents of Silos 1 and 2 and the Decant Sump Tank
18 System and transfer it to a newly constructed, environmentally controlled TTA. This
19 allows for the safe, interim storage of the Silos 1 and 2 material pending remediation by
20 the selected chemical stabilization technology. The contract award also includes the
21 construction of a Radon Control System (RCS) in conjunction with the TTA to control the
22 release of radon-222 to the environment during the retrieval and interim storage of Silos 1
23 and 2 material in the TTA. In addition, the RCS will have the capability to control the
24 release of radon-222 to the environment during the transfer, treatment, and interim
25 storage of the Silos 1 and 2 material within the remediation facility.

2.0 REMEDIAL DESIGN SCOPE AND STRATEGY

2.1 Scope of the Silos 1 and 2 Remedial Action

The selected remedy for the Silos 1 and 2 material, approved in the ROD Amendment, consists of:

- Complete removal of the contents of Silos 1 and 2 and the Decant Sump Tank System sludge from the TTA, followed by treatment using chemical stabilization to stabilize characteristic metals to meet Resource Conservation Recovery Act (RCRA), as amended, toxicity characteristic limits and attain the NTS WAC.
- Gross decontamination, demolition, size reduction, and packaging of concrete from Silos 1 and 2 structures followed by shipment for off-site disposal at the NTS or an appropriately permitted commercial disposal facility (PCDF).
- Disposal of contaminated soil and debris, excluding concrete from Silos 1 and 2 structures, in accordance with the FEMP On-site Disposal Facility WAC or an appropriate off-site disposal facility, such as the NTS or a PCDF.

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In addition, the selected remedy includes the following components, which were *not* reevaluated and remain as documented in the original OU4 ROD:

- Off-site shipment and disposal of the chemically stabilized waste at the NTS.
- Decontamination and demolition (D&D) of all structures and remediation facilities.
- Removal of the earthen berms and excavation of the contaminated soils within the OU4 boundary, to achieve remediation levels in the OU5 ROD.
- Appropriate treatment and disposal of all secondary wastes at either the NTS or an appropriate PCDF.
- Collection of perched water encountered during remedial activities for treatment at OU5 water treatment facilities.
- Continued access controls and maintenance and monitoring of the stored waste inventories.
- Institutional controls of the OU4 area such as deed and land-use restrictions.

2.2 Silos 1 and 2 Remediation Contract Strategy

The remedy for Silos 1 and 2 material is planned to be accomplished under a Firm-Fixed Price/Firm Fixed Unit Price contract. The contractor will have demonstrated experience with the proposed chemical stabilization technology. A Request for Proposal (RFP) is planned to be issued to potential contractors, with issuance expected in the fall of 2000.

As specified in the ROD Amendment, potential contractors shall submit a proposal based upon treating Silos 1 and 2 material by a commercially demonstrated chemical stabilization technology. For the purposes of this selected remedy, the chemical stabilization technology is defined as a non-thermal treatment process that mixes Silos 1 and 2 material (including Bentogrout™) with a variety of chemical additive formulations (e.g., lime, pozzolans, gypsum, portland cement, or silicates) to accomplish chemical and physical binding of the constituents of concern.

Contractors may propose construction of a temporary treatment facility at the FEMP or use of existing mobile facilities or fabrication of equipment at off-site facilities for transfer and assembly at the FEMP. The RFP evaluation criteria take into consideration approaches that maximize the use of pre-constructed modular and skid mounted process units and that minimize the generation of primary and secondary wastestreams.

Technical Proposals will be evaluated to establish a competitive range of contractors. The contractor offering the overall best value to the government, with technical and price factors considered, will be selected.

The services of the contractor shall include:

- Interface with appropriate FEMP personnel;
- Performance of the work in a safe and regulatory-compliant manner;
- Design, construction, start-up, operation, maintenance, shutdown and dismantlement of treatment facilities;
- Design of container to allow for the safe transport and disposal of treated Silos 1 and 2 material;
- Removal, treatment, packaging, and interim staging of the Silos 1 and 2 material; and
- Gross decontamination and shutdown of the TTA and RCS.

Dismantlement of the TTA and the RCS will be performed under a separate subcontract.

Fluor Fernald, Inc., will be responsible for arranging the transportation of treated and packaged Silos 1 and 2 waste to the NTS upon verification by Fluor Fernald, Inc., that the contractor's treated Silos 1 and 2 wasteform meets the NTS WAC. Fluor Fernald, Inc., will also be responsible for arranging the transportation and disposal of all secondary waste generated by the contractor including contaminated equipment not removed by the contractor at the completion of Silos 1 and 2 remediation activities.

2.3 FEMP Remediation Contract Strategy

The DOE plans to award a performance-based contract by September 30, 2000, for continued environmental remediation and closure of the entire FEMP site. The objective of the procurement action is to accelerate completion of the remediation, restoration and closure of the FEMP through both self-performance and the use of competitive subcontracting. Since the scope of the contract for the closure of the FEMP site includes the remediation of the Silos 1 and 2 material, the Silos 1 and 2 remediation strategy accepted from the FEMP site contractor may vary from the current remedial design strategy and impact milestones identified in this RDWP. Any such impacts will be identified and incorporated into a revised RDWP and submitted to the EPA for approval.

[END OF SECTION]

3.0 SILOS 1 AND 2 REMEDIAL DESIGN IMPLEMENTATION

3.1 Remedial Design Process

The Silos 1 and 2 Project is separated into six general work phases:

Remedial Design Phase: Design and Documentation Phase
Construction Phase
Start-up Phase

Remedial Action Phase: Operation Phase
Facility Shutdown and Demolition Phase
Demobilization Phase

The design of the treatment facility will be conducted during the design and documentation phase. During this phase, the contractor shall perform the calculations, engineering, and design activities necessary to develop process and support facilities to (1) retrieve and transfer the Silos 1 and 2 material from the TTA, and (2) treat and package the Silos 1 and 2 material for transportation and disposal.

Fluor Fernald, Inc., will provide oversight and management of the contractor's activities under the contract, to ensure that the overall project is implemented in accordance with the OU4 ROD as modified by the ROD Amendment and in accordance with ARARs, DOE Orders, and other requirements that are specified in the RFP. Fluor Fernald, Inc., will also be responsible for: (1) arranging disposal of the treated Silos 1 and 2 waste at the NTS and providing final treatment of wastewater generated on-site at the Advanced Wastewater Treatment Facility, and (2) arranging for transportation and disposal of all secondary waste, including contaminated equipment and debris from project dismantlement activities.

3.2 Remedial Design Submittals

3.2.1 Receipt of Contractor Schedule

After award of the contract, the selected contractor shall provide a schedule identifying submittal dates for the required design deliverables to Fluor Fernald, Inc., for review and acceptance with contract requirements. The contractor's schedule will be used to establish the enforceable milestones identified in **Table 4-1**.

As the contractor submits the design deliverables, Fluor Fernald, Inc., will review the documentation to ensure that the requirements, as set forth in the RFP, have been incorporated into the design and planned operations.

Throughout the process of receiving design deliverables, DOE will keep the EPA and OEPA involved through review and approval of the following remedial design submittals.

3.2.2 Site Preparation Package

The objective of the Site Preparation Package is to identify the design documentation necessary to prepare the Silos 1 and 2 Project site for the facilities and infrastructure required for this project.

The purpose of the Silos 1 and 2 Site Preparation Package is to convey the requirements for site development and preparation for facilities and infrastructure associated with the Silos 1 and 2 Project. The concepts and ideas proposed by the contractor will be developed into final design drawings, specifications, and calculations.

Examples of construction activities that would constitute the site preparation phase for the Silos 1 and 2 Project include the following:

- 1 • Installing office trailers and construction facilities;
- 2 • Erecting erosion controls and access barriers;
- 3 • Building access roads and gravel parking areas;
- 4 • Installing aboveground and underground utilities;
- 5 • Installing facilities for stormwater management;
- 6 • Performing site grading and preparing laydown areas;
- 7 • Performing excavations and preparing subgrade for foundations;
- 8 • Installing gravel, vapor barriers, etc., for foundations;
- 9 • Installing pre-cast sumps, reinforcing steel, embedded items, piping, and grounding
10 related to the foundations; and
- 11 • Placing concrete mat foundations for support facilities.

12 The Site Preparation Package will consist of drawings and specifications that depict the
13 design and installation of the aforementioned activities. The Site Preparation Package will
14 include a Pre-operational Environmental Control Plan. This plan provides the basis for
15 compliance with the dust control, soil excavation, soil management, stormwater
16 management, and erosion control requirements for the Silos 1 and 2 project construction
17 activities.

18 3.2.3 Remedial Design Package

19 The contractor will submit a RD Package, which will be submitted for EPA and OEPA
20 review, comment, and approval. This RD Package will provide the EPA and OEPA with an
21 understanding of the design, retrieval, operation, and controls necessary in the
22 contractor's treatment facility to ensure protection of the workers, public health, and the
23 environment.

The RD Package will contain comprehensive documents prepared by the contractor pursuant to the contract submittal register and substantive information based on detailed engineering, design, and proposed operations. The RD Package will include, at a minimum, the following information:

- Design documentation
 - Silos 1 and 2 treatment technology description;
 - Description of interface with the TTA and the RCS;
 - Process description;
 - Process flow diagram;
 - Heat and material balance;
 - General arrangement drawing; and
 - Design specifications.
- Permitting Crosswalk describing compliance strategy with applicable or relevant and appropriate requirements and substantive permit requirements.
- Process Control Description.
- Description of Health and Safety controls for construction.
- Preoperations schedule.

3.2.4 Remedial Action Work Plan

Following approval of the RD Package by the EPA and OEPA, a RAWP will be prepared and submitted to the EPA and OEPA. This plan will specify the implementation strategy and establish the operation and D&D milestones for the RA phase of the Silos 1 and 2 Project.

4.0 SCHEDULE FOR THE SILOS 1 AND 2 REMEDIAL DESIGN

The design for the Silos 1 and 2 RA will take place according to the milestones listed in Table 4-1. An initial, contractor deliverable will be a detailed project schedule outlining the submittal of specified design deliverables and other documents to Fluor Fernald, Inc., for review and acceptance. Based on this schedule, enforceable dates will be established, and the RD Deliverables Schedule will be submitted to the EPA for approval of subsequent remedial design milestones.

TABLE 4-1
MILESTONES FOR THE SILOS 1 AND 2 REMEDIAL DESIGN

Milestone	Date
Projected Award of Contract.	10/12/2002
Submittal of the RD Deliverables Schedule to EPA.	120 days after award of Contract
Submittal of the draft RD Package for Silos 1 and 2 Project to EPA.	To be specified in the RD Deliverables Schedule.
Submittal of the draft Silos 1 and 2 RA Work Plan to EPA.	To be specified in the RD Deliverables Schedule.

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3212

FEMP-SILOS 1 & 2 RDWP - FINAL
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